VME64xP 6U Crates for the ANNIE Experiment

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Summary

- ANNIE needs four 6U VME64xP crates for the Fast ADC (FADC) VME cards developed for the KOTO experiment in Japan
  - Voltages needed
    - +5V @ 38A, +3.3V @ 40A, +7.5V @ 25A, -7.5V @ 5A
    - +-12V not needed
  - Four crates needed
    - Software development at Iowa State
    - Test stand at Fermilab
    - Two for production system at SciBoone
- Inventory at DZero
  - Four VME64XP crates in MCH1 (Used in DZero L1CAL)
  - Three Wiener power supplies that fit in the crates are available with the correct voltages
    - Used in SMT system
    - Only have -7V (not -7.5V), should be okay
- Short term solution
  - Power supplies for crate already at Iowa State
- Long term solution
  - Use VME64xP crates and Wiener power supplies from DZero
  - Other sources at Fermilab
  - Fermilab support for replacing power supply?

Requirements

- Requester is Jonathan Eisch from Iowa State
- The +5v and 3.3v are used “as is” by the ADC cards.
- The ± 7.5 V inputs are converted to clean ±5v (for the analog side of things) by a LM1085IT and a LM337T, respectively.
- The dropout for the LM337T is ~<2.5V at the operating temp and current, which drives the -7.5V requirement.
- The ± 7.5V can be supplied by default on the ±V1 pins, or optionally on the ±12V pins (just by moving the fuse connections).
- The reason to not use ±12V is the amount of heat dissipated, but we could 8V or 9V or so without problem.
- A ±12V supply that allows 50% voltage trimming would be the easiest, if we can find it.
- The power supply we have has an identical set of terminals on the back.
  - See the following slides for images
- +5V @ 38A, +3.3V @ 40A, +7.5V @ 25A, -7.5V @ 5A
  - Also see the table later in this document

Questions and Answers

- Let me make sure I have this right. You have a VME64X crate.
- Now you need the correct power supplies and cabling?
  - Yes, we have the "RITTAL: 3687005-06" crate from swap.
  - It is built to the VME64xP (ANSI/VITA 23-1998) standards as a 7U subrack (for 6U cards).
  - We also have the "RITTAL: VIPA-PS", but it doesn't have a 3.3V supply, and I'm pretty sure the ±12V can only be trimmed ±10%.
- What is the difference between the two crates in the quote? 8U vs. 9U?
  - The 9U crate can take transition modules, the 8U has the power supply mounted behind the backplane and can only take a ribbon cable in the transition module plug.
  - We don't have any foreseen need for anything on the transition side.
- How many of these crates do we need?
  - Two would allow us to double our throughput, so if at all possible, two.
  - Since we're in the "no-budget" mode, we physically only need one, and dealing with throughput can just be more firmware on my end.
- Now the question from left field. Are these ADCs required or available?
  - They _are_ run 1. We have them in hand.

VME Power Requirements

Voltage	CPU	ADC	CPU+16 ADCs	CPU+20 ADCs
+5V	7.28	1.5	31.28	37.28
+3.3V	-	2	32	40
+7.5V (+V1)	-	1.25	20	25
-7.5V (-V1)	-	0.25	4	5

More Questions and Answers

- Mike Matulik
  - A couple of comments / questions: 6U high? - Yes, 6U high
  - Three of the four voltages listed are not common to the VME crates commonly found around D0, so we will not likely have ± 7.5 and 3.3V supplies readily available.
  - I'm not sure that we used many V64x crates / backplanes, but can look around.
- Bill Lee reported that the DZero STT crates have +3.3V supplies.
  - Mike Cherry and I checked these supplies. They deliver 300A. Not usable.
- Jonathan Eisch
  - I've copied Mircea Bogdan, the designer of the ADC cards for his input on using switching power supplies there.
    - We discussed the power supplies this morning, and agreed that switching power supplies should be fine.
  - There is filtering on the power input to each card and converted to ±5V by linear regulators which should reduce any noise.
  - +5 and +3.3 volt supplies, there is only digital electronics on those lines.
  - The ±7.5V supplies are converted to ±5V for the analog components, and these would be sensitive to noise to some extent.

Additional Requirements?

- Mike Matulik
  - Beyond voltage and current, are there any specific requirements for the power supplies?
  - Switching power supplies are inexpensive, small and light.
  - By design, they typically generate more noise than linear supplies, which are more expensive, larger and heavier.
  - Digital circuitry is generally not very sensitive to noise, so is often powered with switching supplies.
  - Analog circuity can be powered by switching power supplies, but we'd have to understand the frequencies that the circuitry is sensitive to and then either find a supply that doesn't generate noise in those ranges, filter the power or both.
  - There are two primary methods for powering a 6U VME crate; power supplies integrated into the crate structure, or power supplies in an external chassis with a wiring harness as an umbilical to the crate.
  - Since we haven't identified the power supplies, neither option is currently off the table.
  - The Wiener solution is an integrated one, so we'll look into that first. If an integrated solution is required, please let us know.
- Geoff Savage
  - PREP might have VME 64X crates.
  - Just not the correct power supplies.
  - Level 1 cal at DZero also has V64X crates on MCH1.

VME64xP Crate at Iowa State (1/2)

VME64xP Crate at Iowa State (2/2)

Quote for a New Wiener Crate/Power

Qty	Item	Description	Price	Total
1	VME6021x610_Special	VME6021x610_Special:VME64x crate;8U;21 slots J1/J2 for 6U/160mm VME64x cards;with UEL602EX fan; UEP6021 max. 3kW;+5V 115A;+/-12V 23A;+3.3V, +7.5V/46A (+V1) and -7.5V/46A (-V1) 115A:auto-range AC input	$9,785.00	$9,785.00
1	VME6023x610_Special	VME6023x610_Special:VME64x crate;9U;21 slots J1/J2 for 6U/160mm VME64x cards;with UEL602EX fan; UEP6021 max. 3kW;+5V 115A;+/-12V 23A;+3.3V, +7.5V/46A (+V1) and -7.5V/46A (-V1) 115A:auto-range AC input	$9,955.00	$9,955.00
		Sub Total		$19,740.00
		Shipping & Handling		
		Taxes	0.000%	$.00
		TOTAL		**$19,740.00**

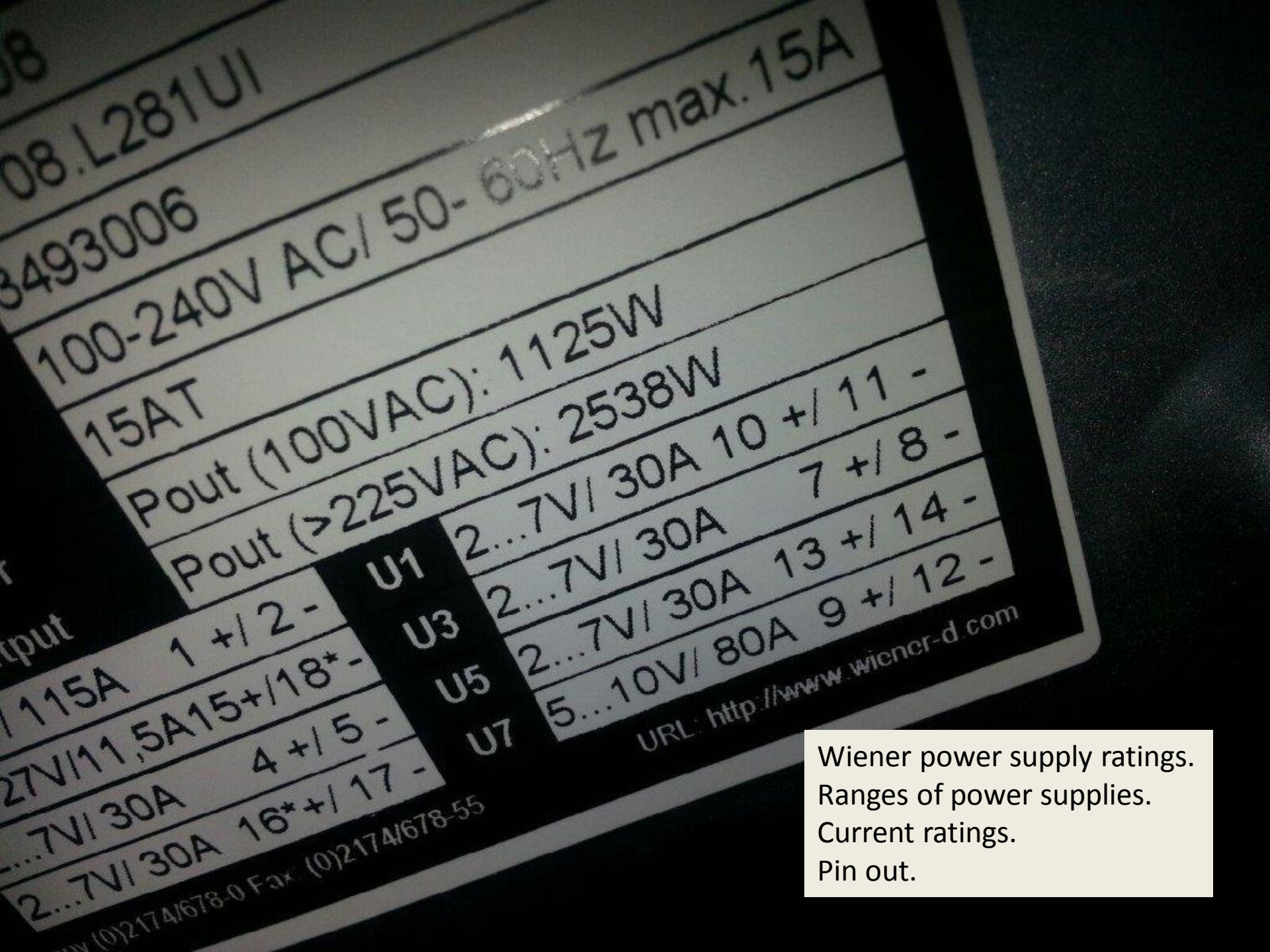
Terms:		Andreas Ruben
Delivery time:	about 10... 12 weeks a.r.o.	
Delivery:	f.o.b. Springfield-OH, add shipping	Office Use Only:
Payment:	MC/VISA (add 2.5% for orders of $5,000 or more) or net 30 after credit approval,	
Warranty:	3 years parts and labor	
Validity of this offer:	1 month.	

VME64xP backplane

- VME64xP is known also as 64x standard for Physics or VIPA-standard.
- The VME64xP is designed as an 18-layer board in strip-line technology and is available with 21 slots (full size). The backplane is actively terminated and provides active automatic daisy chaining.
- The 21 slot monolithic J1/Jaux/J2 backplane has more than 300A current capability on 5V, which corresponds to 15A per slot (at 70°C).
- http://www.wiener-d.com/sc/parts-accessories/backplanes/backplane-vme64xp.html

10/14/2015 Review at DZero

- Mike Cherry and Geoff Savage reviewed VME64x crate equipment at DZero on 10/14/2015
- Research from Mike and Mike
  - $1k for +-7.5V, 3.3V, and 5V
  - 3.3V and 5V are in the same supply
  - Conflict between 3.3 and 5V combo supply and existing VIPA-PS (+-12V and 5V combo)
- Wiener supplies
  - Need +5V interlock, can be removed at Wiener
  - Is 7V the new 7.5V? Only on negative side.
  - SMT Layer0
    - One supply = 5 to 10V @ 80A
    - Five supplies = 2 to 7V @ 30A
  - Four crates at DZero in MCH1 – Remove one to verify



Wiener power supply ratings.
Ranges of power supplies.
Current ratings.
Pin out.

Backplane of VME64xP crates on MCH1.